CALTRANS S.F. DOWNTOWN STATION RELOCATION EIS/EIR

PEDESTRIAN ACCESS ANALYSIS OF THE MARKET/BEALE STREET TERMINAL STATION OPTIONS

PREPARED FOR

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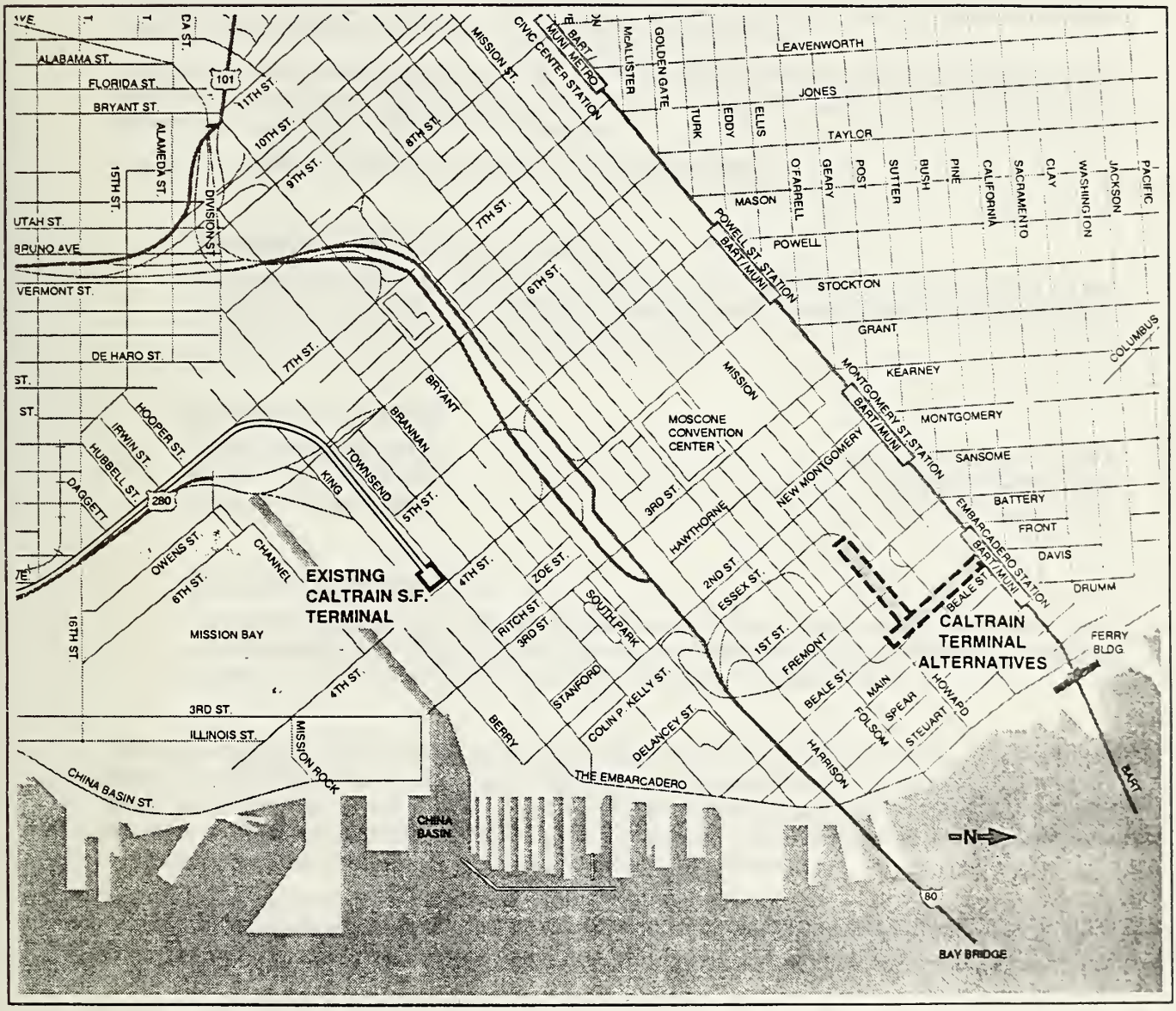

Description of the Alternatives

This analysis examines and compares the potential walk access impacts of the three alternative Caltrain Terminal locations under consideration in downtown San Francisco.

These alternatives all entail a subway railroad extension that would terminate in a stub end station beneath Beale Street in the vicinity of Mission Street. This analysis examines the effect of the station location on those CalTrain commuters who walk to work in the City.

This analysis does not include those who may be transferring between the CalTrain system and the other local transit system facilities in San Francisco such as BART, MUNI or AC Transit since the different alternatives have little effect on those trips.

The three alternatives analyzed in this study include the following:

Alternative 1 - Market Street - 4 Tracks

This station would have four stub end platform tracks terminating at Market Street on two levels, two on the level below the mezzanine and two more two levels down. Entrances would be provided at Market, Mission and Howard Streets.

Alternative 2 - Market Street - 2 Tracks

This station would have four platform tracks all on the first level below the mezzanine. Two tracks would extend to Market Street and two would end at Mission Street. Because of this offset, an additional street access would be provided at Folsom Street for the south end tracks.

Alternative 3 - Mission Street

In this alternative, all four tracks would terminate at Mission Street on the same level. Four portals would be provided with the addition of a moving sidewalk in the mezzanine starting at Howard Street to Market Street with mid-point access at Mission Street.

The three alternatives analyzed in this study include four sets of portals, or entrances along Beale Street. These portals would be located at Market Street, Mission Street, Howard Street and Folsom Street depending on the alternative. The differences between each of the alternatives consists primarily of the location and length of the station platforms. These differences in turn account for variances in the internal circulation patterns of the terminal's patrons.

The initial part of this analysis examined how the various trips in the City relate to the four station portals. This analysis also examined how a moving sidewalk would impact the walk access times of those most likely to walk to their place of work from the new Beale Street facility to Market Street and north.

The travel information is based on HBW (home based work) extracted from the San Mateo County Transportation Demand Forecast (TDF) Model. Approximately 23,000 person trips originating in San Francisco, San Mateo and Santa Clara Counties were identified.

These 23,000 trips represent those trips or persons originating along CalTrain's Peninsula Commuter Line, that terminate in downtown San Francisco. For the purposes of this analysis, the downtown San Francisco area was defined as being bounded by Van Ness Boulevard to the west, the Embarcadero (Fisherman's Wharf Area) to the north and east and Sixteenth Street to the South. Table 1 indicates the distribution of respective origins of the trips analyzed.

Table 1
County of Origin

San Mateo County	60%
Santa Clara County	33%
San Francisco County	7%

The San Mateo County Transportation Demand Forecast (TDF) model assigns origins and destinations by travel analysis zones (TAZs). 31 San Francisco TAZ "centroids" were identified for use in this analysis as shown in Table 2. These locations were manually geocoded, or assigned to an identifiable centroid (i.e., Chinatown) or street corner (i.e., 9th and Mission) for analyzing travel time. Models like the San Mateo TDF are typically designed to analyze travel behavior patterns in a larger regional context. For this smaller scale focus, it is important to understand that the Zone Name represents the centroid of a geographic area and not a literal street address and specific trips.

Once each centroid was assigned a location, the location of each from the Beale Street Station was determined using a street map. For those TAZ within a mile of the proposed station location, walking distances along streets were determined using orthogonal paths around blocks and buildings. These estimated distances were then rounded off to the nearest 100. The 31 TAZs considered in this analysis range from 1,200 feet to 11,000 ft. From Beale Street.

Since this analysis deals only with those persons who would walk to their destination, only those TAZs within 3,500' of the station were analyzed. These are shown in Table 3 ranked by total person trips.

Table 2
31 San Francisco Travel Analysis Zones by TAZ # Identifier

San Mateo TDF Model Zone Number	Zone Name Approximate Location of Centroid	Approximate Walking Distance (in ft.) from Station Portals	North of Market	Total Person Trips
408	5th and Townsend	7,000	No	793.00
409	2nd and Folsom	1,900	No	960.00
410	7th and Townsend	9,000	No	609.00
411	7th and Bryant	7,000	No	408.00
412	5th and Folsom	4,500	No	341.00
413	7th and Folsom	6,500	No	668.00
414	9th and Mission	8,000	No	520.00
415	5th and Mission	4,500	No	543.00
416	3rd and Mission	2,400	No	2,160.0
417	2nd and Mission	1,200	No	2,749.0
418	Sacramento and Battery	1,600	Yes	1,296.0
419	Broadway and Sansome	3,500	Yes	927.00
420	California and Montgomery	2,100	Yes	1,101.0
421	Chinatown South	2,800	Yes	531.00
422	Kearney and Sutter	2,500	Yes	3,452.0
423	Stockton and O'Farrell	2,800	Yes	2,436.0
424	Civic Center North	8,000	Yes	187.00
425	Larkin and McAllister	9,000	Yes	298.00
426	Larkin and Pine	6,500	Yes	59.00
427	Larkin and O'Farrell	7,000	Yes	86.00
428	Leavenworth and Bush	2,800	Yes	349.00
429	North Beach	8,000	Yes	358.00
430	Chinatown North	4,000	Yes	65.00
431	Fisherman's Wharf North	9,000	Yes	416.00
432	Fisherman's Wharf South	9,000	Yes	110.00
433	Union Street	10,000	Yes	116.00
434	Larkin and California	6,500	Yes	77.00
435	Mission Bay	11,000	No	381.00
711	Civic Center South	8,000	Yes	272.00
712	China Basin	9,000	No	112.00
713	Mission Rock	7,500	No	812.00
	Total			23,192.

Table 3
10 San Francisco Travel Analysis Zones Within 3,500' of the Proposed Station Ranked by Trips

Approximate Location of Centroid	San Mateo TDF Model Zone	Nearest Beale Street Station Portal	Approximate Walking Distance (in ft.) From Nearest Station Portal	Total Person Trips
Kearney and Sutter	422	Beale and Market	2,500	3,452
2nd and Mission	417	Beale and Mission	1,200	2,749
Stockton and O'Farrell	423	Beale and Market	2,800	2,436
3rd and Mission	416	Beale and Mission	2,400	2,160
Sacramento and Battery	418	Beale and Market	1,600	1,296
California and Montgomery	420	Beale and Market	2,100	1,101
2nd and Folsom	409	Beale and Folsom	1,900	960
Broadway and Sansome	419	Beale and Market	3,500	927
Chinatown South	421	Beale and Market	2,800	531
Leavenworth and Bush	428	Beale and Market	2,800	349
Total Trips				15,961

The analysis indicates that Caltrain service destinations on the north side of Market Street, within 1 mile of the new station portals make up almost 10,150 person trips or about 43% of all of the trips examined. Almost 70% would be within a 3,500' walk of the new station, if those zones off of Mission and Folsom Streets are included.

For the station access component of the analysis, four potential station street level portal locations were identified. These four station portals are located at approximate 650' intervals along Beale Street at:

A. Market Street
B. Mission Street
C. Howard Street
D. Folsom Street

The alternatives have however varying platform lengths and depths that will effect changes in access times to the San Francisco destinations.

Access demands are weighted heavily towards the northern Market Street end of Beale Street, and diminish as one moves further south as shown in Table 4. Based on the location of the TAZs, disregarding the estimated walking distances, the northern end of the station can be expected to serve the largest number (approximately 52%) of San Francisco destinations. Mission Street with its large number of trips at 2nd 3rd and 5th Streets (Zones 417,416, and 415 respectfully) would serve about 26 % of the destinations. The portals on Folsom and Howard Streets would together serve less than 25% of the trips.

It is important to note that while the TAZ's have been assigned fairly specific locations, they represent areas or clusters of attractions. For analysis purposes, what may in reality be a range of diverse and dispersed circulation patterns have been intentionally condensed.

Table 4
TAZ Proximity to Each Portal

Beale Street Station Portal	Percentage of Total Person Trips
Beale and Market Streets	52%
Beale and Mission Streets	26%
Beale and Folsom Streets	19%
Beale and Howard Streets	3%

The following tables indicates that about 51% of the Caltrains passengers will be within a ½ mile or a 10 minute walk from the Beale Street Facility, and that almost 70% of the passengers will be within ¾ of a mile or a 15 minute walk. Table 5 organizes the trips by the proximity to each portal. Table 6 takes the distances and equates them in terms of total percentages and walking times.

Table 5
Walking Distances in San Francisco from the Proposed 4 Portals and the Number of Person Trips

	1/4 mi	*½ mi*	*3/4 mi*	*1 mi*	*11/2 mi*	*2 mi*	*All*
Dist. in feet.	1,320	2,640	3,960	5,280	7,920	10,560	
Market Street		5,849	10,092	10156	10,379	12,136	12,136
Mission Street	2,749	4,909	4,909	5,452	5,452	5,973	5,973
Folsom Street		960	960	1,301	3,315	4,036	4,415
Howard Street					668	668	668
Totals	2,749	11,718	15,961	16,910	19,816	22,815	23,192

Table 6
Walk Access Times from Each the 4 Portals as a % of All Trips

Portal	*1/4 mi. 5 min.*	*½ mi. 10 min.*	*3/4 mi. 15 min.*	*1 mi. 20 min.*	*1.5 mi. 30 min.*	*2 mi. 40 min.*	*All*
Market Street		25%	44%	44%	45%	52%	52%
Mission Street	12%	21%	21%	24%	24%	26%	26%
Folsom Street		4%	4%	6%	14%	17%	19%
Howard Street					3%	3%	3%
Totals	12%	51%	69%	73%	85%	98%	100%

Note: Assuming that pedestrian speeds for commuters are approximately 3 mph, or 267 ft/min. (Unconstrained pedestrian commuter flows John J. Fruin cited in Urban Space for Pedestrians, Table 3.3, p. 81)

Moving Sidewalks and Escalators

This analysis examines the lateral, horizontal effects of the two block long people mover, the vertical separation differences for each alternative have been taken into account separately.

Pushkarev and Zupan have noted in Urban Space for Pedestrians[1] that in the United States, moving sidewalks and escalators both operate at the same speed, approximately 120 ft per minute, "substantially below normal walking speed". These limits are designed to reduce liability and to avoid sudden acceleration and loss of balance by people stepping on and off. There have been efforts to design transitional, "accelerating" sections that would allow automated walkways to increase their effective speed by a factor of three. While a threefold increase in the speeds of such automated walkways would allow them to be competitive with downtown bus or taxicab service, they had not, achieved wide spread acceptance due to liability issues.

In order to compare the relative travel time differences between the alternatives it is important to identify the number and final destinations of those commuters who would be most directly affected by the selection of the alternative.

Destination

Table 7 identifies ten TAZ zones within a 3,500' walk of the proposed station and divides them into three separate and distinct groups based upon their final TAZ destination. These groupings consist of:

Northern Destinations, primarily north of Market Street

Midtown Destinations, in the vicinity of Mission Street between 1st and 4th Streets, and

Southern Destinations, In the vicinity of 2nd and Folsom.

The seven TAZs identified as Northern Destinations account for over 10,000 trips or 62% of the total trips identified within 3500'. These seven TAZs are all located north of Market and are within 3,000 ft. of the intersection of Market and Beale. Caltrain passengers destined for these TAZs would be expected to enter and exit the new Beale Street station at the northern portals.

Table 7 multiplies the respective distance between the station and the TAZ by the number of trips.

[1]Pushkarev, Boris and Zupan, Jeffrey, Urban Space for Pedestrians, 1975, p.108

Table 7
Downtown San Francisco Travel Destinations and Total Commuter Distance

Zone Name	Distance From Beale St. Portal	Total Person Trips	Total (Dist.x Trips)
Kearney and Sutter	2,500	3,452	8,630,000
Stockton and O'Farrell	2,800	2,436	6,820,800
Sacramento and Battery	1,600	1,296	2,073,600
California and Montgomery	2,100	1,101	2,312,100
Chinatown South	2,800	531	1,486,800
Leavenworth and Bush	2,800	349	977,200
Broadway and Sansome	3,500	927	3,244,500
2nd and Mission	1,200`	2,749	3,298,800
3rd and Mission	2,400'	2,160	5,184,000
2nd and Folsom	1,900	960	1,824,000
		15,961	

Based on experience in other applications such as the UAL termina in LAX, it is assumed that regular commuters will walk on the moving sidewalk.

Table 8 outlines the velocity assumptions used in the analysis. Therefore, the 380 ft./min. moving sidewalk velocity is based on a 260 ft./min. walking speed combined with 120 ft./min. moving sidewalk speed.

The analysis assumes that the moving sidewalk in Alternative 3 is designed to minimize constraints due to queuing nd that they would be able to efficiently handle the detraining passengers without delay in eithre direction.

Table 8
Assumptions

Commuter Walking Speed	260	ft./min.	2.95	mph
Walking Speed on Moving Sidewalk	380	ft./min.	4.32	mph
Escalator Grade	70%	V/H		
Escalator Speed	120	ft./min.	1.36	mph

Table 9 shows the cumulative walk times to each of the 3 destination sub-groups identified earlier.

Table 9
Destination Walk Times

Zone Name	Distance from TAZ to Beale Street Portal	Total Person Trips	Walking Time From Beale Street (Min.)	Cumulative Walk Time in Minutes
Kearney and Sutter	2,500	3,452	10	33,192
Stockton and O'Farrell	2,800	2,436	11	26,234
Sacramento and Battery	1,600	1,296	6	7,975
California and Montgomery	2,100	1,101	8	8,893
Chinatown South	2,800	531	11	5,718
Broadway and Sansome	3,500	927	13	12,479
Leavenworth and Bush	2,800	349	11	3,758
2nd and Mission	1,200	2,747	5	12,688
3rd and Mission	2,800	2,160	11	26,234
2nd and Folsom	1,900	960	7	7,015
Total		15,961	AVG. = 9	144,186

For the station interior circulation analysis, four possible exit portals corresponding to train door positions on the platform were identified:

A. Market Street
B. Mission Street
C. Howard Street
D. Folsom Street (Alternatives 2 and 3 only)

In order to determine the cumulative effect of the station layout alternatives, the outbound passengers' access patterns have been distributed in accordance with each alternative's unique characteristics. The analysis also took into account whether or not the alternative included a multi-level station like Alternative 1. Table 10 depicts the two dimensional distribution of passenger exit for each of the three station alternatives, for each of the three destination groupings identified. The columns indicate the horizontal distance from a common point on the path to the final destination, or that Beale Street portal declared to be the closest to the largest number of TAZs. The "subgrade" rows represent the platform levels. For analysis purposes the station levels were determined to be 20' apart floor to ceiling.

These distributions were designed to estimate the cumulative differences in travel times of each alternative station platform configuration.

Table 10.1
Distribution of Passenger Egress for Northern Destinations

Alternative 1

	Folsom 1,800' from Market	Howard 1,200' from Market	Mission 600' from Market	Market
Subgrade 1 20' below	N/A	16% 1,200' walk	16% 600' walk	18%
Subgrade 2 40' below	N/A	16% 1,200' walk	16% 600' walk	18%

Alternative 2

	Folsom 1,800' from Market	Howard 1,200' from Market	Mission 600' from Market	Market
Subgrade 1 20' below	14% 1,800' walk	32% 1,200' walk	36% 600' walk	18%

Alternative 3

	Folsom 1,800' from Market	Howard 1,200' from Market	Mission 600' from Market	Market
Subgrade 1 20' below	33% 600' walk 1200' moving sidewalk	33% 1200' moving sidewalk	34% 600' moving sidewalk	

Table 10.2
Distribution of Passenger Egress for Midtown Destinations

Alternative 1

	Folsom 1,200' from Mission	Howard 600' from Mission	Mission	Market 600' from Mission
Subgrade 1 20' below	N/A	16% 600' walk	18%	16% 600' walk
Subgrade 2 40' below	N/A	16% 600' walk	18%	16% 600' walk

Alternative 2

	Folsom 1,200' from Mission	Howard 600' from Mission	Mission	Market 600' from Mission
Subgrade 1 20' below	14% 1,200' walk	34% 600'' walk	38%	14% 600' from Mission

Alternative 3

	Folsom 1,200' from Mission	Howard 600' from Mission	Mission	Market 600' from Mission
Subgrade 1 20' below	33% 600' walk and 600' moving sidewalk	33% 600' moving sidewalk	34%	

Table 10.3
Distribution of Passenger Egress for Southern Destinations

Alternative 1

	Folsom	Howard 600' from Folsom	Mission 1,200' from Folsom	Market 1,800' from Folsom
Subgrade 1 20' below	N/A	18% 600' walk	16% 1,200' walk	16% 1,800' walk
Subgrade 2 40' below	N/A	18% 600' walk	16% 1,200' walk	16% 1,800' walk

Alternative 2

	Folsom	Howard 600' from Folsom	Mission 1,200' from Folsom	Market 1,800' from Folsom
Subgrade 1 20' below	36%	32% 600' walk	18% 1,200' walk	14% 1,800' walk

Alternative 3

	Folsom	Howard 600' from Folsom	Mission 1,200' from Folsom	Market 1,800' from Folsom
Subgrade 1 20' below	34%	33% 600' walk	33% 1,200 walk	

Findings

Table 11 summarizes the access time differences between the three Beale Street Station Alternatives.

The analysis indicates that considering the average passenger's total cumulative travel time between the train and their final downtown San Francisco destination, the difference between the three alternatives varies by less than one minute. While the cumulative, average differences in access times between the altematives are insignificant, it should be noted that an individual's access times will depend on a number of variables including on which end of the 800' train (a 3 minute walk) the individual exits and where in the city their particular destination is.

Table 11
Comparison of Alternatives in Minutes

	Cumulative Walk Time (min.)	Cumulative Moving Sidewalk Time (min.)	Cumulative Escalator Time	Cumulative Walk Time, Station to TAZ (min.)	Train to TAZ Cumulative Time for all (min.)	Average per Person Travel Time (min.)
Alt. 1						
Northern Destinations	22,358		4,289	38,922	124,897	12.4
Mid	7,658		2,204	7,015	48,783	9.4
Southern	4,342		408	98,250	11,766	12.3
Total				144,187	11.4 Min. Average Travel Time	
Alt 2						
Northern	18,166		2,859	98,250	119,275	11.8
Mid	7,419		1,469	38,922	47,809	9.2
Southern	2,193		272	7,015	8,794	9.2
Total				144,187	10.8 Min. Average Travel Time	
Alt. 3						
Northern	7,685	26,452	2,859	98,250	135,247	13.4
Mid	3,949	2,702	1,469	38,922	47,041	9.1
Southern	2,193		272	7,015	9,481	9.9
Total				144,187	11.8 Min. Average Travel Time	